

DEVELOPMENT OF THE CAUDAL LAMELLAE IN *AUSTROARGIOLESTES ISABELLAE* THEISCHINGER AND O'FARRELL (ODONATA: MEGAPODAGRIONIDAE)

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Abstract

The caudal lamellae in larval *Austroargiolestes isabellae* Theischinger & O'Farrell are described and illustrated. The appendages are strongly nodate for much of the larval development.

Introduction

Caudal lamellae, the hypertrophied paraprocts and appendix dorsalis are found at the end of the abdomen in larval damselflies. They are believed to function as external gills, aids to swimming and in enhancing displays (Johnson 1991). The development of these organs has been described in general terms by Tillyard (1917a, b) and MacNeill (1960). There was however, little information on caudal lamellae in the Megapodagrionidae and the development of the Australian megapodagrionids remained undescribed.

Tillyard (1917a) described and figured the lamellae of the final instars of two Australian species of *Argiolestes*. He remarked on the unusual dorso-ventrally flattened structure of these organs in Australian Megapodagrionidae, a unique feature in his experience. Although Tillyard never saw the early stages he concluded that the lamellae showed evidence of this type originating from a two-jointed form. This supposition is confirmed in the observations presented here.

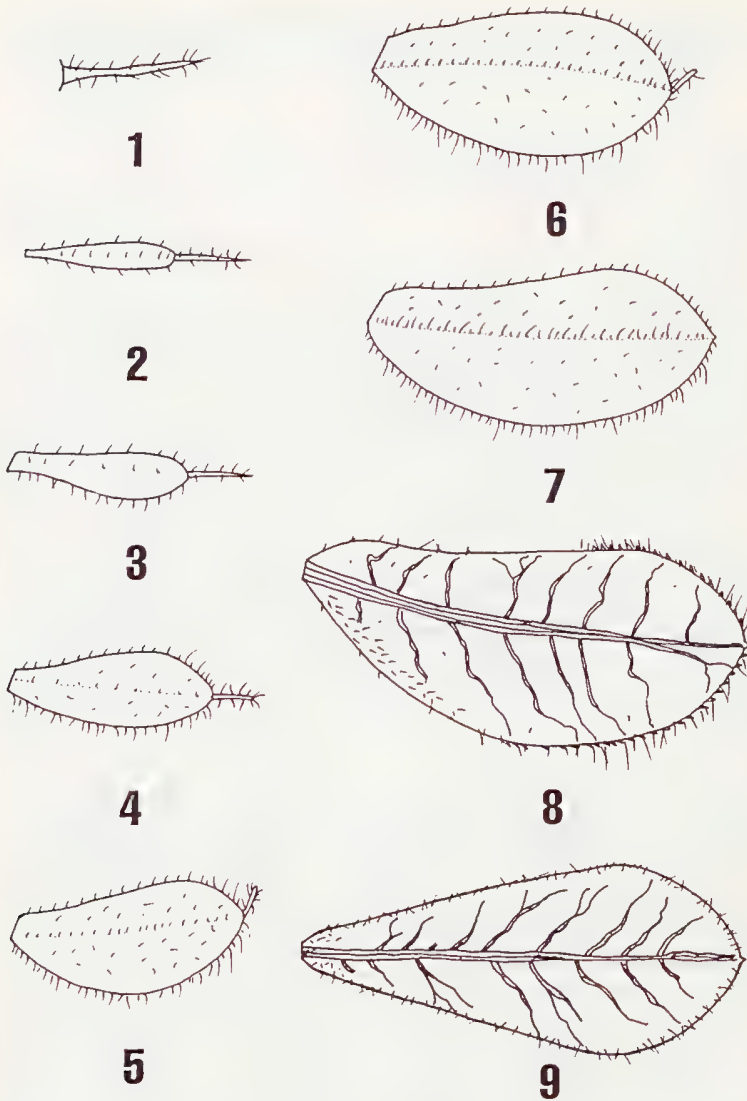
Methods

Exuviae of *Austroargiolestes isabellae* Theischinger & O'Farrell were collected during the rearing of this species (Murray 1992). Lamellae of instars 2-8 were studied on exuviae placed in a small Petri dish containing water. Final stage lamellae were removed from one exuvium and mounted on slides with Euparal. Drawings were made using a 'Vixen' stereo-microscope.

Results

The first instar (prolarva) was not seen and observations began with second-instar larvae. The morphology of the second-instar larva is remarkably uniform throughout the Zygoptera and the caudal lamellae of *A. isabellae* had the characteristic single-segmented style-like form, covered with setae (Fig. 1).

At the moult to the third instar the caudal lamellae became strongly nodate, appearing two-segmented, with a club-shaped basal and a style-like distal portion (Fig. 2). Both portions were of almost equal length. Widely spaced small setae marked the lateral carina and fringed the margin of the proximal



Figs 1-9. Development of the caudal lamellae in *Austroargiolestes isabellae*, dorsal view. All except Fig. 9 are of the left lamella: (1) single-segmented style-like appendage of second instar; (2) two-segmented (nodate) appendage of third instar; (3-6) nodate form in fourth to seventh instars; (7) penultimate instar; (8) final instar; (9) median lamella of final instar. (Not to scale).

portion. A scattering of setae was present over the surface. In early instars lamellae were spread in the usual way and later they were held horizontally.

Through subsequent moults the basal portion of the lamellae grew and became progressively more flattened and leaf-like in appearance. There was a gradual increase in setae on the lateral carina and about the margins. Both short and long setae occurred, the latter concentrated around the more rounded margins of the segments and on the lateral carina, especially through the later stages of development.

In contrast with the expansion of the basal portion, the style-like distal portion shortened (in absolute terms) with each moult, reducing in relative size from nearly half the length of the basal portion in the fourth instar (Fig. 3) to approximately one quarter in the fifth instar (Fig. 4) and thereafter was minute in comparison with the basal portion (Figs 5, 6). The style was lost completely by the penultimate instar (Fig. 7), being replaced by a small tapering tip to the basal portion. This pointed tip in turn was lost at the moult to the final instar when lamellae were subequal and uniformly rounded at the tip. The lateral lamellae were narrow at the base and broader distally and were asymmetrical about their long axis, with the more convex margin of each lamella held outermost (Fig. 8). The median lamella was symmetrical in shape, with lateral margins mostly straight and expanding from a narrow base to a broader distal end (Fig. 9). In living animals the median lamella was held at a slight angle to the laterals when viewed laterally.

Discussion

The Megapodagrionidae have a circumtropical distribution but both the higher taxonomic positioning of and relationships within the family are very uncertain (Houston and Watson 1988). Australian forms are characterised by the unusual dorso-ventral flattening and horizontal positioning of the caudal lamellae of the larvae. Confirmation that *A. isabellae* develops through a highly nodate saccoid stage may throw light on the relationships between the Australian Megapodagrionidae and other problematic taxonomic groups in the region.

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